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A THEORY OF CONFLICT

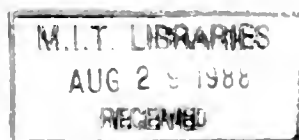
Judith A. Lachman*

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ABSTRACT

Disputes not resolved by negotiation may lead to conflict. This paper investigates the course and outcome of such conflict between two parties, who respond with aggressive behavior to injury experienced at low levels but become submissive in response to sufficiently high levels of harm.

Legal sanctions, analyzed in terms of the marginal penalty associated with increased harm, may affect the occurrence or outcome of conflict. The paper finds, however, that a policy tradeoff exists between deterring the occurrence of conflict and limiting the harm in conflicts which do occur. Moreover, the deterrent effects of legal sanctions can be enhanced--or vitiated--by other forms of sanction such as social sanctions and sanctions internalized by the individual party. Conflict behavior is also affected by the availability or "prices" of activities which serve as alternatives to conflict. Finally, because equilibria at low levels of harm may be unstable, under some conditions the conflict can easily escalate in an "arms race" fashion to much greater levels of harm.

Although applicable in a variety of dispute contexts, the theory is developed more fully here in the context of disputes between individuals, and then examined briefly in its application to the labor relations setting.

A THEORY OF CONFLICT

Parties to a dispute who are unable to reach negotiated agreement may turn to other processes for resolving their differences: Management and labor may turn to binding arbitration, for example, if their contract or a statute so specifies; parties to a legal dispute are subject to the decision of a regulatory agency or court. In these and other settings, a third party is called upon to determine the outcome, and that outcome can be imposed upon the parties whether they affirmatively assent to it or not.

By contrast, other disputes may involve direct conflict between the parties, who pursue their dispute in that fashion until the course of conflict determines the result.¹ Industrial strikes and lockouts, international armed conflict, tariff wars, and interpersonal conflict are examples in which third parties capable of intervening lack a mandate to do so, do not exist, or are unable to intervene before the conflict has taken its course.²

This paper presents a general theory of conflict between two parties, developed first in the context of conflict between individuals, and then briefly applied to the industrial relations setting. There are several reasons for beginning the analysis here. Perhaps most obvious is the fact that parties to many sorts of disputes, ranging from labor unions to countries

at war are themselves collections of individuals, with conflict occurring within as well as between these groups.' Second, it has often been the prospect of such conflict which prompted creation of third-party decisionmakers such as courts and arbitrators. Criminal and tort law find their beginnings in the search for alternatives to private justice, much as the jury trial itself supplanted trial by combat.⁴ Understanding two-party conflict may therefore contribute to better understanding the role and effectiveness of third-party processes for dispute resolution. Third, the problem of interpersonal conflict implicates issues of current policy interest, including the deterrent effect of the death penalty, secondary effects of unemployment, and policies toward the family.

I. The Tie to Previous Work

Although economics has offered a panoply of theories about disputes resolved by negotiation⁵ as well as disputes resolved by third-party decision-makers,⁶ it has offered relatively few about disputes resolved by conflict between the primary parties.⁷ The literature which does exist has emerged principally in the area of labor economics, addressed to those factors affecting the occurrence and outcomes of strikes. Sir John Hicks' model of labor negotiations (1927) described the wage settlement as depending upon the "expected length of strike" but provided no corresponding theory of actual strike duration. More recently, Orley Ashenfelter and George Johnson

presented and estimated a model in which management seeks to maximize the value of its future profits in light of anticipated union concession behavior; and in which the union's "acceptable" wage falls with strike duration. Although the union's behavior in striking at all is viewed as being at odds with its collective self-interest, the strike is characterized as serving a constructive purpose "as an equilibrating mechanism to square up the union membership's wage expectations with what the firm may be prepared to pay."⁸ The disparity between the political aspirations of union leaders, as fostered by an adversarial stance with management, and the union members' financial self-interest apparently leads the organization to embark on an otherwise anomalous course.

Extending the Ashenfelter and Johnson framework and estimating the resulting model, Henry Farber (1978) found the union's rate of concession to vary with the potential effectiveness of a strike. Both the Ashenfelter and Johnson model and the Farber variant on it assume that the pattern of union wage concessions is one of exponential decay over the course of the strike; and that management, sizing up this concession schedule in advance, acquiesces in the strike whose duration and resulting wage concessions yield a maximum present value for the firm's future profit stream. Although each paper offers explanations in support of the concession function adopted -- the former attributing its functional form to a learning response by the union (p. 37 n.11) and the latter

characterizing it as an asymptotic approach toward the best alternative wage available to union members -- they appear to view the determination of the concession function as yet an open question."

Melvin Reder and George Neumann found empirical support for their model of strike behavior in which the bargaining parties engage in lower strike activity where the strike's combined costs to the parties are higher. Characterizing the bargaining problem as one of "joint choice" (p. 867), the authors investigated explanatory factors affecting this choice without constructing separate models of union and management concession behavior. Consequently they, like the previously-mentioned authors, did not focus specifically on continued interaction between the parties, such as might occur in the course of an ongoing strike.

Yet, where parties can engage in interactive behavior during a conflict the resulting outcome may be affected. And "[i]n the absence of special behavioral assumptions, there is no way to assure that the implied cycle of actions and reaction will, in fact, converge to an equilibrium solution," as John Gould has pointed out (p. 287). For purposes of tractability in analyzing litigation decisions, Gould made the assumptions necessary to obviate the potential problems of escalating conflict; but as a consequence, his initial reservations remain unresolved. As discussed in later parts of this paper, the

concern about existence and stability of equilibria is prescient and well-founded.

While conflicts may in the industrial relations context be viewed as mistakes -- occasioned perhaps by the divergence between political incentives faced by union leaders and financial self-interest of the rank and file -- the scant literature on social interaction adopts a different perspective. Relationships characterized by "envy and hatred,"¹⁰ considered within Gary Becker's theory of social interactions, admit of the possibility that conflict could supplant concord, with malevolent behavior contributing to the satisfaction of a party. In Becker's theory, the social environment acts as an input to the production of "basic wants" -- which in turn provide utility -- and hence any changes in social interaction affect the utility attained by an individual in a manner similar to that of changes in more tangible factors of production.¹¹

In contrast to the conflict analysis of economics, the behavioral sciences offer a menu of theories in which discussion of goal-pursuing behavior is largely absent; these theories seek chiefly to explain violent behavior on the part of persons who know one another. Learning theorists, such as Dollard, Henry and Short, and Freud in his earlier years, characterize aggression as a "learned" response to frustration, pain or threat (labeled the "frustration-aggression theory"). In particular, physical aggression is an adaptation or learned

response to stresses which arise in the ordinary course of family and work life.¹² Other sources of frustration include the failure to realize past expectations about the present and despair at poor prospects for the future.¹³ This sort of learning or adaptation is apparently a normal experience: "Individual pathology is but a minor element [in interpersonal violence]. Few if any of the people...studied can be considered as suffering from any gross abnormality." (Gelles; 1972:16).

A second school of thought, represented by Lorenz, Freud (eventually) and others contends that aggression is not a learned response, but rather, an instinct "...and therefore an inborn aspect of the human endowment."¹⁴ These social scientists, too, consider aggression a normal behavior.

Still other researchers, particularly anthropologists and sociologists, describe behavior in terms of cultural factors such as the social legitimation and acceptability of violence.¹⁵ Winston Churchill once speculated that the increase in violence following World War I was partly attributable to the war behavior itself,¹⁶ a view consistent with this approach. Finally, sociological studies of deterrence suggest that violent behavior -- whatever its origin -- may be reduced by the prospect of legal penalties, a perspective shared by much of the existing economics research on criminal behavior.¹⁷

Despite this diversity in approach, the theories generally attribute to the aggressor a surprising degree of rationality and control; they recognize the ability of the individual human not to attack, and to so refrain by choice. Contrary to the popular notion of crimes of passion, "[a]ttack is far from inevitable." "In humans...anger is seldom followed by destructive attack."¹⁸ Even instinct theorist Lorenz cites the need to "control our natural inclinations...."¹⁹ In short, aggression involves some degree of discretionary behavior and is hence an appropriate subject of economic investigation.²⁰

A second item of agreement among those who have researched it is the finding that serious conflicts in a relationship are frequently part of a sequence of such incidents marked by successive escalation in levels of injury.²¹ Further, the victim may play a vital role in initiating (Barnard et al.) or provoking the conflict.²² Where single-conflict events do occur, they tend not to be atypical, isolated events in a relationship.

Third, the wide variation in occurrence of violence suggests that some conditions are more likely than others to give rise to conflict. For example, rates of violence have been shown to vary among countries and cultural subgroups;²³ among different age and income groups;²⁴ by religion and race;²⁵ by month day of the week, hour of the day;²⁶ even under different weather conditions.²⁷ These and other empirically

noted relationships suggest that, far from being determined by the single effects of instinct, or of learning experience, or by prevailing social standards, conflict occurs in the presence (and absence) of all these conditions; and changes in underlying variables result in a changed conflict response.

Concepts Employed in the Theory

Summarizing the behavioral literature here for the purpose of building an economic model -- and, in particular, seeking to analyze conflict in terms of goal-pursuing behavior -- I draw upon the following concepts:

1. Individuals engage in conflict not as an end in itself but as a means to another end; aggression or harm to another person yields satisfaction, and may be represented as an argument in the utility function.²⁸ Here, increased satisfaction is interpreted to mean decreased stress, where the latter term has a rather specific meaning in medical-behavioral terms, associated with various physiological manifestations such as heart rate, adrenaline, and other indicators.²⁹

2. The seriousness of the conflict is measured by the harm inflicted by each of the parties upon the other.³⁰

3. Increased satisfaction (stress reduction) may be accomplished through engaging in conflict, as suggested above,

or by non-conflict alternative activities. Although the list of possibilities is long and differs from one individual to another, it will be assumed in the analysis which follows that the alternative activity for an individual is known and its availability measurable. Such activities might include finding a job, obtaining a loan, participating in community groups, and other "constructive" activities which provide satisfaction and require one's effort (time).

4. Legal, social, and internal sanctions -- i.e., the levels of these sanctions and the extent of their enforcement -- act as a price for conflict behavior. Legal sanctions represent a public price effected through fines, imprisonment, and other forms of penalty.²³ Social sanctions reflect the acceptability of conflict behavior within the individual's reference group, with violence being more acceptable in some cultures or occupations than in others.³² Internal sanctions are primarily a reflection of an individual's biography, with lower internal penalties frequently a reflection of experimental familiarity with violence.³³

5. Individuals typically respond to relatively low levels of violence with anger and aggressiveness -- often responding to injury in kind -- but beyond some level of prospective harm, they respond with fear and submissiveness. In the former range of harm, anger serves to "discount" the price effects of other

forms of sanction; in the latter range, fear tends to accentuate the effects of the penalties, as discussed further below. It is this response to threat or pain which constitutes the equilibrating mechanism in the two-party conflict model that follows.

II. Theoretical Framework

A. Equilibrium for an Individual

The behavioral literature associates increased satisfaction, in the form of decreased stress, with the level of aggressive activity H (harm) and with levels of alternative activities, L , where the latter are in the nature of job search, recreation, or other nonconflict activity.³⁴ If the preference function of the individual is assumed to exhibit the usual properties of positive but declining marginal utility with respect to each of the independent variables, then one can derive the compensated demand functions

$$H = f_H(p_H, p_L, U^*) \quad (1)$$

and

$$L = f_L(p_H, p_L, U^*), \quad (2)$$

where p_H is the "price" of engaging in conflict behavior; p_L signifies the price of the best alternative to conflict, as, for example, the search cost of finding employment; and U^* denotes

the initial utility level.³⁵ The negative signs of $\partial H/\partial p_H$ and $\partial L/\partial p_L$ are consistent with theories of criminal deterrence (Ehrlich, 1973; Cook) and of labor force participation (Bowen and Finegan; Block and Heineke). With activities H and L considered to be substitute goods, a positive sign of $\partial H/\partial p_L$ is consistent with earlier findings on the effects of unemployment on criminal behavior generally (Fleisher, 1963, 1966; Wolpin) and the frequently noted relationship between violence and the business cycle (Brenner, Thomas), discussed elsewhere in this paper.

The price of aggression, p_H , is developed in more detail as follows. Let $y(H)$ be the structure of statutory penalties, where y measures, for example, years of sentence as an increasing function of the level of harm.³⁶ The penalty function is assumed to be continuous and twice differentiable, except possibly at $\max\{H\} = H^*$ which represents death of the victim and typically carries substantially more severe penalties. In general form then,

$$y(H) = \begin{cases} y_h(H) & \text{for } H < H^* \\ y^* & \text{for } H=H^*, \end{cases} \quad (3)$$

and $dy/dH > 0$, $y^* \geq \sup \{y_h(H)\}$.³⁷

The enforcement of statutory penalties, $e(H)$, is also an increasing function, with death of the victim possibly invoking markedly greater enforcement. We assume that both the statutory

penalties and their enforcement increase at an increasing rate with H and thus for effective sanction $e(H)y(H)$, we have

$$d(e.y)/dH > 0 \quad \text{and}$$

$$d^2(e.y)/dH^2 > 0$$

for $H \in (0, H^*)$, (and $e(H)y(H) \leq e(H^*)$ for $H \leq H^*$). Let $h(H)$ be the probability that death occurs, even though the intent is to inflict H harm;¹⁸ we expect $dh/dH > 0$, $d^2h/dH^2 > 0$. The expected legal sanction is then

$$s(H) = h(H)e(H^*)y(H^*) + (1-h(H))e(H)y(H), \quad (4)$$

a function which assigns relatively more weight to the penalties for homicide as the likelihood of its occurrence increases.

The effect of legal sanctions is then represented by the marginal legal penalty structure $s(H)$, which is a positive increasing function of H . (The marginal penalty structure is used here, since the unit "price" of aggression is not constant for all values of H .) Although this penalty structure is fixed in the short run, it is altered in the longer term by public and private actions affecting enforcement practice and statutory law,¹⁹ and by the technologies of medicine, transportation and weaponry, which determine the likelihood that a given injury results in death. For example, improved medical care in route to the hospital causes $h(H)$ to fall, and would reduce the

expected sanction by assigning lower weight to homicide penalties.

Mitigating or enhancing the effect of legal penalties are: (1) social sanctions $g(H)$ which are determined by standards of one's profession, neighborhood or other reference group; and (2) internal sanctions $m(H)$ reflecting one's upbringing and experiences, with, for example, m being lower, *ceteris paribus*, for persons in whose childhood homes violence was acceptable and commonplace.⁴⁰ For simplicity, we assume g and m constant, and the effective structure of sanctions is

$$p_H(H) = p(g, m, a, s'(H)) \quad (5)$$

where a represents additional factors such as anger which alter perception of the legal, social and internal sanctions in a consistent -- i.e., order preserving -- fashion as discussed more below. The effect of alternative values of a , g , and m is to shift the effective penalty function (the analog of supply), thus changing the price at which equations (1) and (5) are simultaneously satisfied. Substituting from (5) into (1), the condition for equilibrium of the individual is that

$$H = f_H(p(g, m, a, s'), p_L, U^*). \quad (6)$$

Given the assumptions made in constructing the effective penalty function, the equilibria arising from alternative values

or functional forms in equation (5) merely trace out the demand function. For the set of solutions represented by equation (6), then we have H/g , H/m , H/a , $H/s' \leq 0$, and $H/p_L \geq 0$, as before.

Even with this simple model for an individual, several interesting comparative statics results emerge. Among the more obvious ones, we would expect greater frequency of violence within groups or societies where the social sanctions are low (*ceteris paribus* legal sanctions). This is consistent with anthropological findings for both literate and nonliterate societies (Palmer). Sociologists and others contend that although the form of violence varies among countries, the countries in which social sanctions are comparatively lower tend to experience higher levels of violence.⁴¹

The inventory of factors associated with lower internal sanctions includes the absence of other persons in the room (Gelles, 1972), violence in the childhood home (Henry and Short; Gelles, 1972), and housing density and crowding (Carstairs; Bettelheim); where these conditions occur, violence is more frequent than otherwise.

Much of the behavioral research on individual violence cites the disparity between aspirations and achievement as a major source of stress. Since any utility increase, $U-U^*$, reflects the gap between the individual's aspiration and actual

attainment, it is reasonable to search for conditions affecting the end points of this gap. Political scientists and others have characterized group violence as response to disappointment when achievement falls short of expectations; in the case of revolutions, this disparity may occur even in the face of a net improvement in social and economic achievement (Davies; Berkowitz; Buss).⁴² Gurr carries the analysis further, using data on collective violence to support his theory that "relative deprivation" is a cause of civil strife. Interestingly, his findings align well with those of economists Danziger and Wheeler linking levels of criminal activity with relative position in the income distribution.⁴³

A second setting in which the gap between aspirations and achievement plays a role is presented by a sociological theory of stress on the family as a function of stage of the life cycle (Gove et al.). Briefly stated, the theory links stress on the family -- which may be indexed by financial stress -- to the disparity between available resources and perceived needs. In the early stages of the family life cycle, for example, total labor force participation and consequently, income, are reduced even as expenses mount rapidly with the arrival of children. The level of stress subsides markedly only later, as children begin leaving the home and bringing income into the house, and in any event, providing greater autonomy to the parents in the use of their income and time resources. This age profile of stress on the family is replicated across demographic groups,

with the timing of pressure peaks varying with the occupation and education of parents; the stress periods may be more or less concentrated, depending upon the spacing of children.

Juxtaposing the life cycle theory of stress with the model presented above, we would expect that if aggression occurs in families in response to stress, these incidents would be more likely to occur at stages of the life cycle characterized by greater stress. (This is not to say that such incidents will occur for any given family, since other variables affect the decision to engage in aggressive behavior.) Indeed, the age profile of assailants in aggravated assault cases⁴⁴ closely resembles the profile of stress over the family life cycle, as depicted in Figure 1. Here, stress over the life cycle is represented by a proxy measure, the number of children under age five per thousand women in each age category (Census).⁴⁵ This finding and the earlier cited behavioral research are consonant

[Figure 1 here]

with the characterization of stress as arising from the disparity between aspirations and achievement.

B. Interaction and Conflict

In the model of an individual presented above, reference was made to additional factors which alter the price of aggressive behavior. Here we make the definition more explicit,

and provide some examples of the way these additional factors affect the occurrence and outcome of conflict.

Consider first the effects of anger and fear. In terms of physiological response, these emotions may be viewed as manifestations of a single emotion, differing from one another primarily in degree rather than in kind.⁴⁶ Adopting the notion introduced earlier, we associate anger with lower values of a and fear with higher values. In accordance with the behavioral literature (e.g., Dollard et al), we assume that as the level of harm experienced increases, so does anger, up to some point, after which fear sets in. That is, as harm to the individual increases, the value of a falls (and the effective sanction declines) until increased harm serves to augment the price of aggression, and further harm experienced by the individual results in submissiveness, that is, in decreased aggression in response. In Figure 2, p_H^1 represents the penalty function which obtains (instead of p_H^0) when anger results in value a^1 instead of a^0 . Alternatively, when fear causes the effective penalties to rise, p_H^2 is the relevant penalty function.

[Figure 2 here]

Relabelling the terms introduced earlier by adding the subscript 1 for party I and denoting by H_2 the harm which party II causes to party I, the equilibrium conditions for party

I are rewritten as

$$H_1 = f_{H_1}(p_{H_1}(g_1, m_1, a_1, s_1'), p_{L_1}, U_1^*) \quad (7)$$

$$a_1 = k_1(H_2) \quad (8)$$

with $H_1 = r_1(H_2)$ first rising (aggressive range), reaching a maximum and then declining (submissive range) as graphed below in Figure 3.

[Figure 3 here]

These assumptions regarding the shape of the response function are consistent with the empirical findings on individual response to aggression (see e.g., Dollard and Miller). A similar argument is made by Gurr with respect to group response; he finds empirical support for a function of this form in estimating the magnitude (casualties) of civil strife as a function of coercive force used by the relevant authorities.⁴⁷ A special case in which only the submissive portion of the function appears in the relevant domain would be similar to the concession pattern assumed by Ashenfetter and Johnson and by Farber (1978).

Replicating the preceding analysis for the second party yields the corresponding functions:

$$H_2 = f_{H_2}(p_{H_2}(g_2, m_2, a_2, s_2'), p_{L_2}, U_2^*) \quad (10)$$

$$a_2 = k_2(H_1) \quad (11)$$

which in turn give the response relationship

$$H_2 = r_2(H_1). \quad (12)$$

The functions $r_1(H_2)$ and $r_2(H_1)$ depict the response by each party to harm inflicted by the other, and are similar to the reaction functions of duopoly or bilateral monopoly theory.⁴⁸

The points (H_1, H_2) which satisfy both response functions constitute the set of equilibrium outcomes; for a given pair of response functions, the equilibrium need not be unique. (For example, if both parties exhibit response function of the form sketched in Figure 3, there may be as many as four equilibrium outcomes.)

Several special cases are of interest: When party i remains unperturbed (or at least unresponding) in the face of harm, then $r_i(H_j) = 0$ and the final level of harm experienced will be $H_j = r_j(0)$, which is generally (but not necessarily) less than the harm to j were he to respond more actively to harm inflicted upon him. In the event that both parties exhibit this kind of response, the level of harm to each party is zero. These response functions might arise, for example, because of the personalities of the parties (as a permanent part of their relationship), or they could occur for a particular conflict because of the availability of escape.

Alternatively, one party may respond to all levels of harm H_j with a fixed harm \bar{H}_i , thus allowing the other party's action to determine the level of harm he (i) experiences. Depending upon j's response function and the level of H_j , this approach could easily result in greater harm to party i or to both parties.⁴⁹

Although the points (H_1, H_2) satisfying both response functions are equilibrium points, they may differ in their stability properties. When the derivative of $H_1 = r_2^{-1}(H_2)$ exceeds that of $H_1 = r_1(H_2)$, the equilibrium point represented by their intersection is stable, and thus presents a reasonable outcome of the conflict: equilibrium can be restored in the face of small disturbances. However, when $r_1' > r_2^{-1'}$, the equilibrium is unstable,⁵⁰ and the equilibrium point may lead to what has been elsewhere characterized as an "arms race" (Richardson, 1960a; Boulding) in which the level of conflict escalates until one or both parties have been incapacitated or killed.⁵¹ Thus, in Figure 4 below, points B and C represent stable equilibria for response functions II_i and II_j , respectively, but point A represents an unstable equilibrium.

[Figure 4 here]

For response functions such as those depicted in Figure 4, disturbances resulting in departure away from point A may take the conflict to resolution at points B or C, depending upon the applicable response function for II .⁵² However, for different response functions -- in particular, when a stable equilibrium does not exist at levels of harm greater than those occurring at A --

disturbance from point A may result in successive escalation of harm. This would occur, for example, in the limiting cases in which neither individual's response function exhibits a range of submissiveness, or in which the counterpoint of point B or C occurs at injury levels exceeding death of one party. (This escalation could also occur in the absence of an unstable equilibrium as, for example, when the response functions do not intersect in the relevant range of H_1 and H_2).

The stability of equilibrium is of concern here for two reasons: First, it is useful in investigating the diversity of violent behavior among persons subject to the same sanctions: it tells a story consistent with nonlethal intended harm in some conflicts, as well as unintended death occurring in others. Second, it suggests that policy measures or other exogenous changes may reduce harm both by inducing general reduction in levels of response (as discussed in examples to follow) and by introducing stable equilibrium outcomes in conflicts from which they would otherwise be absent. This is illustrated in Figure 5, where I_1 is I's new response function.^{5 3}

[Figure 5 Here]

The response functions may be rewritten to denote the presence of the various sanctions and other factors assumed constant in the preceding discussion, i.e.,

$$H_1 = R_2(p_{H1}(g_1, m_1, a_1(H_2), s'_1, p_{L1}, U_1^*)U_1 \quad (13)$$

$$H_2 = R_1(p_{H2}(g_2, m_2, a_2(H_1), s'_1, p_{L2}, U_2^*)U_1 \quad (14)$$

and the effects of differing conditions on conflict behavior analyzed. For example, the use of alcohol and certain other drugs ("downers") occasions a shift in the response function --inducing a lower value of m , the level of internal sanction-- as a consequence of the relaxation of inhibitions and decreased fear response which attend increasing levels of these substances in the body. This circumstance implies generally higher levels of injury associated with the presence of alcohol and other drugs, a conclusion with which empirical findings agree (Geerken and Gove, 1977).⁵⁴

Similarly, if an individual has access to a weapon, the reaction function shifts upward until the length of the aggressive stage increases as well. The resulting level of injuries is in general greater for one and possibly both parties; this is consistent with empirical findings on consequences of the presence of weapons (Zimring). Policies reducing availability of weapons⁵⁵ or decreasing the usage of certain drugs and alcohol would result in a downward shift of the response function, and in generally less harm experienced in conflict.

III. Implications and Extensions of the Theory

The theory of decisionmaking by an individual assigns importance to legal, social, and internal sanctions, and to the accessibility of alternatives to conflict. Additional factors, however, also affect the occurrence and outcome of conflict and

these factors are represented in the response functions of the two parties. This response behavior determines whether conflict occurs at all (i.e., whether $H > 0$); what levels of harm to the parties are associated with the outcome of conflict; and whether the outcome denotes an interior equilibrium or a boundary outcome reached by successive "arms race" escalations of harm.

A. The Legal Price of Conflict Behavior

Much of the emerging economic literature on illegal activity characterizes applicable legal sanctions as the price of a satisfaction-yielding activity, or as a cost involved in the production of an illegal output.⁵⁶ In contrast, the theory presented above assigns a critical but not dispositive role to legal sanctions as determinants of illegal activity, and portrays the price of conflict behavior in terms of the marginal penalties to increased harm. The theory points out that the link between statutory penalties and the price of aggression is a fragile one, easily weakened by other public and private actions:

First, the effectiveness of legal penalties is dependent upon the levels of other forms of sanction. When social or internal sanctions are sufficiently low, even stiff legal sanctions result in a low price for aggression. Conversely, deterrence of conflict will for some individuals be attributable more to the presence of severe social or internal sanctions than to legal prices.

Second, the legal penalty structure reflects enforcement practice as well as statutory penalties specified "on the books". If actual enforcement does not manifest the priorities of statutory law, the effective penalty structure will not be sufficient to carry out legislative intent. In the limiting case, if either $e(H)$ or $y(H)$ is identically zero, the effective penalty structure is zero also.

Consider a variant of this special case in which enforcement is directed toward conflicts resulting in death of a party, i.e., homicides, but not toward other assaults. Then equation (4) becomes

$$s(H) = h(H) e(H^*) y(H^*) \quad (15)$$

for the assumption that $e(H) = 0$ for $H < H^*$ annihilates the second term of equation (4). Since $e(H^*)$ and $y(H^*)$ are scalars, the sensitivity of legal penalties to levels of harm must arise from $h(H)$, the likelihood of victim death given intended harm H . In this situation, the only effective legal penalty for assault (as distinguished from intentional homicide) is the "spillover" from the homicide penalties, with the effect of the prospective penalties diminishing quickly as the difference between H and H^* increases. Further, if the individual's perception is that $h(H) = 0$ for $H < H^*$, which is consistent with the observation that most homicide assailants intended only to hurt their victims, then $s(H) = 0$ (for $H < H^*$) and the homicide penalties (alone) will not only

fail to deter assaults but will also fail to deter most homicides. Thus the success of policies intended to deter homicide is heavily intertwined with the choice of policies pursued with respect to assault.

More detailed consideration of legal sanctions involves dissecting the marginal legal penalty structure into the marginal penalties associated with increased harm beyond an initial level, and the marginal penalty for engaging in conflict at all, that is, the penalty for the first "unit" of H : With social and internal sanctions held constant and $H > 0$, it is the marginal structure itself rather than the absolute levels of penalty which determines the equilibrium for an individual. So, for example, a uniform increase in all sentences leaves the marginal statutory penalties unchanged, and will fail to reduce the levels of injury sustained in the course of conflict.

The importance of the marginal penalty structure highlights another a policy issue, however. A steep marginal penalty function desirable for deterrence purposes requires that penalties for great harm be markedly higher than those for smaller harms. But then a policy tradeoff emerges: Assuming $s(H^*)$ the severest penalty, to be given -- for example, $s(H^*)$ represents life imprisonment or the death penalty -- and $s'(H)$ monotonically increasing, one can obtain greater deterrence of additional harm by decreasing the penalties for initially engaging in conflict, i.e., the marginal penalty incurred for inflicting the first unit of H . The arguments are

familiar: where capital penalties can be assigned for particular crimes, no stiffer sanction remains to deter the killing of witnesses, of police, or other officials.⁵⁷ (The problem is analogous to that of the negative income tax with a given break-even point: improved incentives to work can only be obtained by lowering the income floor applicable to nonworking families.) In the limiting case, if the death penalty or life imprisonment is assigned for the most minor of assaults, we should expect murders to increase. This perspective contrasts markedly with the prescription of harsh sentences to cure all ills.⁵⁸

B. Other Aspects of Conflict Price

In addition to legal sanctions, other factors affecting the price of aggression constitute possible policy instruments as well. For example, if internal sanctions are learned in childhood, as the behavioral literature indicates, then family policies and other programs might be fruitfully directed toward increasing these sanctions. Since internal sanctions are lower when there is overcrowding, policies affecting housing markets would, in effect, constitute policies about conflict as well. Similarly, programs which foster the availability of escape from conflict would permit the response function of one party (or both) to become identically zero, at least for the current conflict event.⁵⁹

C. Alternatives to Conflict

The search for alternatives to conflict has provoked the contemplation and fascination of a variety of researchers. Lewis Richardson, for example, in his search for understanding of "the etiology of conflicts," assembled and examined a list of "pacifiers," defined as conditions whose presence makes the outbreak of a deadly quarrel less likely or its termination more likely.⁶⁰ Examples of such pacifiers of international conflict included entries such as "hating a different group of people" and "distraction by sports."⁶¹ Hermann Mannheim hypothesized that "[s]erious crimes of violence may decline owing to the competition of war as a more impressive form of violence and conversely, they may increase in frequency if war were completely suppressed" (page 208). John MacDonald in his study of murderers and victims notes such constructive outlets for homicidal impulses as employment in a slaughterhouse and appointment as an official executioner.⁶²

The theoretical framework includes these alternatives to aggression as substitutes for conflict behavior, with changes in the price of the relevant alternative activity resulting in changed conflict behavior as well as change in the level of the alternative activity. Easier accessibility of recreation, for example, would be associated with a lower price p_L , a higher level of recreation activity engaged in, L , and a downward shift in the individual's conflict response function. To the extent that both parties experience such response shifts, the "pacifying" influence is

accentuated. Urban mayors seeking funds for summer youth recreation and employment programs, for example, argue that without easy availability of such alternatives, individual or group violence may ensue.

While some individuals engage in recreation as the alternative to conflict, other persons pursue employment, volunteer work, schooling, or other activities. With this diversity of interpretation of activity L, the price p_L is characterized generally as the price of an individual's best alternative to engaging in conflict. Despite the diversity in alternative activities, however, many of the relevant alternatives share similar movements in price as functions of changes in the economic environment. In particular, during times of recession the search cost of obtaining employment rises; the prices associated with other activities increase relative to household resources; and, to the extent that some of these alternatives are provided by state and local governments, falling public expenditures make the activities less easily available. Consequently, one would expect to observe increases in violence during recessionary times. This has indeed been the case, as documented by Harvey Brenner and by Joseph Eyer, each using the series data for the United States.⁶³

These theoretical and empirical findings point to the importance of macroeconomic policy in determining the environment in which violence may occur, for the policy choices may serve to buttress or to weaken the effects of legal sanctions. Programs

affecting local labor markets such as job training programs and public works projects can also be expected to affect conflict behavior, and so may have benefits typically not included in the benefit-cost studies frequently antecedent to such programs.

D. Industrial Conflict

With appropriate adaptation, the theory of interpersonal conflict can be translated to the context of industrial relations, as outlined briefly here. For conflict in the form of a strike, harm inflicted by the union can be characterized in terms of the duration of the strike (as well as, perhaps, the number of strikes). Management inflicts increased harm as its wage offers grow further away (decrease) from the union's initial demands or another suitable benchmark. These harms replace, in this context, the definitions of H_1 and H_2 given earlier. (For lockouts, one could reverse the decision variables of the parties with the following discussion with respect to strikes suitably adapted.)

As in the case of interpersonal conflict, parties to labor disputes are faced with legal sanctions, such as the remedies of the National Labor Relations Act; with social sanctions, such as the pressure exhibited by third parties, including the general public in the case of national emergency disputes; and with internal sanctions reflecting the "biography" of each party as well as historical aspects of the company-union relationship. Where one

or more of these sanctions is lower, one would expect to see greater harm than otherwise.

Government actions may affect not only the level of legal sanctions, but of other sanctions as well. For example, were the Department of Labor to undertake greater enforcement of the Landrum-Griffin Act regulating aspects of internal union governance, the union's internal sanctions could be expected to change. In particular, if a dictatorial union leader with high strike sanctions (e.g., with union response function identically zero) were to be supplanted by democratic decisionmaking in a strike-favoring union ($dH_1/dH_2 > 0$ for $H_1 > 0, H_2 > 0$ where H_1 denotes union-inflicted harm) then one would expect increased harm from strikes, as illustrated in Figure 6.

[Figure 6 Here]

If the parties repeat these behaviors throughout a given time frame, the the type-(b) union will engage in more aggressive strikes than would its type-(a) counterpart. This was roughly the experience of the United Mineworkers Union, for example, in the period before versus the period after the increased enforcement of federal law which followed in the wake of the Yablonski killings.⁶⁴ Such an outcome, consistent with the model, suggests that union democracy is not maintained without cost. To the extent that this outcome is independent of the strike preference or willingness of the members, it poses a critical policy dilemma: Does the attainment of industrial democracy necessitate the sacrifice of industrial peace?

Application of the conflict theory to industrial disputes highlights two additional policy concerns. First, it is possible for both parties, acting rationally, to arrive at a nonzero outcome, since engaging in conflict contributes to the goal attainment of each party; yet, the social desirability of the privately determined conflict outcome is open to question when third parties are affected. The theory suggests that if a zero conflict outcome is socially desirable, its attainment will generally require additional governmental intervention.⁶⁵

Second, as in the case of interpersonal conflict, the profile of legal penalties and their enforcement is critical in determining the overall effective penalty structure. Again, a steep marginal penalty to deter increased harm -- such as per day fines which increase rapidly with strike duration -- requires that the penalties for the first "unit" of harm be low, and vice-versa. Thus a policy tradeoff exists between deterring the occurrence of industrial conflict, and limiting the harm resulting from conflicts which do occur.⁶⁶

IV. Conclusion

This paper has presented a theory in which conflict occurs as a consequence of rational economic decisionmaking by two interacting parties. In the theory, individual equilibrium, and hence the two-party equilibrium, depends upon the effective price of aggression determined by the applicable legal statutes and

enforcement, social sanctions, and internal sanctions. Each party responds to harm inflicted by the other first with anger and then with fear; the former is manifested in increased aggression, and the latter in submissive behavior. Interaction carried on in this way may lead to a stable equilibrium; under other conditions, however, it leads to an unstable solution and possibly to the successive escalation of conflict analogous to an international arms race.

Policies which reduce the conflict response of one or both parties --in the limiting case, yielding an identically zero response for harm experienced by a party-- may succeed in two ways: (1) they may reduce an equilibrium level of harm from the outcome it would otherwise assume within the relevant range where injuries to both parties less than fatal; or (2) they may introduce a lower-injury solution for a conflict otherwise resolved only by the death of one or both parties. Such conflict-reduction policies include not only the obvious one of increased legal sanctions, but also longer-run policies affecting social and internal sanctions, and policies which serve to increase accessibility to alternative activities such as employment and recreation. The accessibility or price of the alternative activity depends upon preference and characteristics of the individual and upon more general environmental conditions. Among other conclusions, this analysis provides a theoretical basis for the empirically observed relationship between violent activity and cyclical fluctuations in

macroeconomic conditions. It is also consistent with a sociological life cycle theory of the family.

More specific to the issue of setting legal prices for aggression by individuals, it is the structure of penalties rather than their absolute level which affects individual decisionmaking once conflict has begun. There is a tradeoff in policy between reducing the occurrence of conflict and reducing the harm in conflict which do occur. Further, it has been shown that effective deterrence of homicide depends crucially upon the legal sanctions for assault, so long as most homicides are the unintended outcomes of assaults.

At a more general level, the theory points to the fragility of legal sanctions as a policy tool when used without regard to other conditions affecting the price of conflict behavior. Becker's arguments on behalf of the importance of including social interaction in models of individual behavior are given ample support by the theory. And the role of internal sanctions in determining the price of aggression leads to some critical questions about the extent to which early experiences and events giving rise to such internal sanctions may dominate perception of price for years to come.

*Sloan School of Management, M.I.T. If there is truth to the adage that a good fight will always draw a crowd, it may explain the kindness of these persons who offered helpful comments: Theodore Bergstrom, Paul Courant, Robert Crutchfield, John Cross, Michael Darby, Michael Geerken, Walter Gove, Edward Gramlich, Jack Hirshleifer, Jan Kmenta, Richard Lempert, Eli Noam, Anthony Oberschall, Llad Phillips, Richard Porter, James Reschovsky, Dan Rubinfeld, Felicity Skidmore, and Harold Votey. John Copeland provided excellent research assistance. I also benefited from comments given in public finance and economic theory workshops at the University of Michigan. The research was supported in part by the National Institute of Mental Health.

¹Within the dispute resolution literature, the term "conflict" is used somewhat ambiguously to denote a dispute or potential dispute; a negotiated agreement; a third-party decision, such as one made by an arbitrator or court; and the process of resolution undertaken by the disputants alone. This paper employs the last of these alternative definitions.

²Indeed, the most salient characteristic of international law is the absence of a body having coercive authority. What authority international law and tribunals do have derives from the voluntary behavior of individual states, potential censure by the world community, and complex interrelations among countries engaged in regularized transactions. See Myres McDougal and W. Michael Reisman. At times, as with the ongoing U.S./Japan dispute over imports, these sanctions are insufficient to resolve disagreement.

By contrast, interpersonal conflict is generally prohibited by the state, but lack of swift and sure enforcement leaves disputes in the hands of the parties, literally.

Under the Norris-LaGuardia Act, barring use of the injunction in labor disputes, and the National Labor Relations Act, industrial relations are intentionally left open for free collective bargaining and the use of strikes, lockouts, and other concerted action. Although employees not covered by the NLRA may be prohibited from engaging in such concerted action, they too (e.g., public employees) have at times engaged in such conflict.

³Ashenfelter and Johnson, for example, go so far as to assert that "there are not two but three parties involved in labor-management negotiations: the management, the union leadership, and the union rank and file" (page 36), and analyze strike decisions as emanating from this divergence of objectives within the union. Donald Martin, in his property rights theory of union behavior, also notes the potential disparity between goals of union leaders and those of members.

It seems that unions do not have a monopoly on such "nonoptimal" behavior. General Electric's management for a number of years followed a policy of making a first-and-final offer in labor negotiations, apparently unwilling to tolerate any modifications of the wage package in any direction. This practice, known as "Boulwarism", continued until it and other acts were determined by the NLRB and U.S. Court of Appeals to constitute bad faith bargaining. *NLRB v. General Electric Co.*, 418 F.2d 736 (ed Cir. 1970), cert. denied 397 U.S. 965, rehearing denied, 397 U.S. 1059. Similiar behavior has been observed in bargaining experiments discussed by Howard Raiffa (pp. 44-77), where subjects faced with firm demands for large concessions chose to reject the proposed settlements, preferring to receive nothing rather than accept only a small gain.

⁴ See Plucknett.

⁵ In addition to the bargaining theories of Cross, Harsanyi, Hicks, and Zeuthen, the bargaining literature encompasses two classes of theories: 1) deterministic theories which suggest specific settlement outcomes; and 2) behavioral theories which associate certain bargaining behaviors with different goals and strategies of the bargainers. Cross and DeMenil review a number of these models, particularly the deterministic ones; Walton and McKersie present and review several behavioral theories.

The deterministic bargaining theories (as well as some of the others) assume that the outcome of a prospective conflict or third-party decision is known, as is the individual's utility associated with that outcome. The bargained outcome providing exactly the same utility -- as, for example, if a negotiated wage of \$3.50 per hour were as desirable to a union as a \$4.00 wage obtained after a two-month strike -- defines the reservation price, and the interval between the reservation prices constitutes the Pareto superior set. Although focusing primarily on the division of the disputed item (the wage, sentence, etc.) within this set, these theories implicitly assign a critical role to the third-party or conflict outcome through its benchmarking role in determining the reservation price. See Cross, who reviews many of these theories.

More recently, scholars have employed frameworks of asymmetric information to analyze decisions to drop, settle or try cases. See, for example, Salant and Rest (1982), Cave (1986), and Reinganum and Wilde (1986). Other models have been used to analyze the effect of litigation cost allocation systems on the settlement-or-trial decision, e.g., P'ng (1983), Bebchuk (1984).

⁶ See Farber (1979) for analysis of arbitration outcome and uncertainty, and their effects on pre-arbitration bargaining. For theories of regulatory and judicial dispute

resolution, see Lucien Bebchuk, John Gould, Patricia Danzon and Lee Lillard, Judith Lachman, William Landes, Richard Posner, and Mitchell Polinsky and Steven Shavell.

⁷Additional theories of conflict include, in the labor context, John Kennan (1985), Clark Kerr and Abraham Siegel, Joseph Tracey, and, reviewing these, Kennan (1987); the tariff war theories of Harry Johnson and Tibor Scitovsky; and the international conflict theories of Robert Axelrod, W. J. Horvath, and Lewis Richardson. Economists and biologists have also begun to analyze within an economics framework the problems of conflict and coexistence among and within species. See, for example, Jack Hirshleifer (1977a, 1977b).

⁸Page 39. Viewed from the perspective of the bargaining theories, a strike occurs as a consequence of the failure to reach a negotiated outcome. It does not follow, however, that strikes are without benefit to one or both of the parties (apart from the wage outcome), as much of the bargaining literature might suggest. Ashenfelter and Johnson's paper provides one variant of the general argument that strikes increase union solidarity. Melvin Reder has characterized the union's willingness to endure a strike as an investment in more favorable management behavior in future periods. See also Freeman and Medoff at 219-220. One could make similar arguments with respect to other sorts of conflicts.

⁹See, e.g., Ashenfelter and Johnson: "The precise shape of [the function] is a matter of conjecture and surely differs between collective bargaining situations...." (p. 37); Farber (pp. 262-263).

¹⁰Becker's (1973) theory assigns a critical role to the manner in which the social environment of the individual is affected by the actions and attitudes of others; the latter are treated as exogenous in what is essentially a one-party model. Isaac Ehrlich (1975) has drawn upon Becker's social interaction theory in his analysis of the deterrent effect of the death penalty. Focusing on murder rather than conflict as the generic event, Ehrlich's model attributes a utility gain to the murderer upon the death of the party toward whom the murderer feels malevolently.

¹¹Using this approach, Becker (1973) examines sharing within families, emulation of neighbors, and other aspects of decisionmaking within the household.

¹²Henry and Short's book is the classic presentation of this theory. Rothenberg provides a review of the theories. Murray Strauss and Richard Gelles provide numerous examples of typical family and work life stresses. Physiological manifestations of stress have also been linked to work life in specific occupations; for example, accountants have been shown to experience increased levels of blood cholesterol as tax

deadlines approach, diet held constant, as discussed by Friedman, et al., and by Eyer (1977a). Indeed, employees experiencing injury from job-related stress have been found to qualify for legal compensation from employers (Ankeny). For a more comprehensive study concerning social and physiological determinants of emotional states generally, including stress, see Schachter and Singer.

¹³ See Rothenberg. Richard Berk writes with respect to group violence, that "there [is]...evidence that relative deprivation reflects people's expectations of what should be [compared with what is] and thus unrest tends to occur not when the economy is really bad, for example, but when hopes are raised either prematurely or in excess of actual performance."

¹⁴ Rothenberg (page 202). He adds,

...[T]here are predispositions to anxiety and anger in relation to particular situations and persons or classes of situations and persons. Such predispositions are so constant and predictable that they may be considered to be structural features of the personality that tend to instigate violence [page 209].

¹⁵ See, for example, Henry and Short, who discuss the sociological and psychological bases for the legitimation of violence in general and for particular forms of violence.

The power of social sanctions to mitigate the effect of legal sanctions is demonstrated in Stanley Milgram's research on the willingness of individuals to obey "legitimate" authority and inflict pain on another person. In these experiments, the influence of "orders" directed toward the subjects was profound; yet even this powerful influence was mitigated when peer rebellion was introduced, thus undercutting the experimenter's authority. One explanation for the potent effects of this peer behavior, Milgram suggested, is that the subject was able to observe that there were minimal consequences of defying the authority. For further discussion of social sanctions see Homans.

The social sanctions may attach not only to behavior, but to the legal sanctions themselves. For example, the effects of an arrest record on employment prospects will reinforce legal sanctions for some social groups (Calvani).

¹⁶ Abbott (1927). Archer and Gartner note that most combatant nations, as contrasted with a noncombatant control sample, experienced substantial postwar increases in their rates of homicide, and that within countries the increases cut across demographic lines: "This wartime reversal of the customary peacetime prohibitions against killing may somehow influence the threshold for using homicide as a means of settling conflict in everyday life" (page 960).

⁷ See, for example, Geerken and Gove, Gibbs (1968b), and Sherman and Berk. Gary Becker's seminal paper on crime (1968) characterized legal penalties as the price of criminal activity, an approach generally followed in the now-extensive economics of crime literature. See, e.g., Ehrlich (1973) and Wolpin (1978), on the deterrent effect of the death penalty; and Cook, who reviews some of the literature; and Polinsky and Shavell (1984).

¹⁶ Rothenberg (pages 200, 205).

¹⁹ Lorenz (page 246).

²⁰ Pasternak (page xii) summarizes: "[M]urder by acutely psychotic persons is rare....In most instances the murderer only sought to hurt his victim." Lorenz makes a similar comparison but from a different perspective, which notes the similarity of behavior in normal and psychopathic individuals.

²¹ A Police Foundation study of files of the Kansas City Police revealed that 85 percent of homicides in families were preceded by one or more disturbance calls to the police, and half of the homicides were preceded by five such events (page iv). Zimring has characterized murders as merely "successful" assaults, and has demonstrated that in many cases the feature which distinguishes murders from assaults is not the degree of murderous intent, but the presence and type of weapon. See also Phillips, Votey and Howell.

²² MacDonald, Pasternak, and Williams each discuss the role of the victim in precipitating violent interchange. Pokorny reports, "It has been found...that in many instances of homicide fierce arguments precede the murder, with progressive escalation in emotion and violence" (page 229). In addition, a recent study by the New York Police Department's Office of Management Analysis revealed that over one-half of murder victims had prior arrest records, and more than half were killed by friends or acquaintances during a dispute (New York Times, August 28, 1977, p. 1).

²³ Richardson's compilation of "deadly quarrels" (1960b) presents variation in rates of violence (incidents per million population per year) ranging from 3 homicides per year in Germany in the period 1882-84 to 610 murders in Chile in 1932. For a more contemporary analysis of demographic patterns see Marvin Wolfgang. See also FBI (1985), presenting differences among ethnic groups within the U.S.

²⁴ Fully 35 percent of assault offenders are over thirty, unusually old as criminals go. Assault and homicide appear to be the most "equal opportunity" crimes of the seven which comprise the Uniform Crime Index; more than other crimes, they span the age, income, and education strata (FBI, 1975, 1985; Gelles, 1972). But see also Williams (1984), finding a positive link between poverty and homicide.

²⁵ See Pokorny, Durkheim, Richardson, and Gelles (1972) on differences by religion. Henry and Short find homicide rates to be cyclical for blacks and countercyclical for whites. They find suicide to be cyclical, with upper-class whites more frequently responding to stress with suicide than with homicide. See also Daniel Hamermesh; Jack Gibbs (1968b); New York Times, Oct. 5, 1986, Sec. 4, p. 20 (stress-related suicides due to farm crisis).

²⁶ The FBI, Gelles, and Richardson (1960b) all report increases in violent activity on the weekend -- Sunday usually leading Saturday -- with similar differences by time of day, in rough accord with the periods in which more household members are likely to be at home.

²⁷ Richardson (1960b) reviews several studies finding aggressive crime more frequent in hot weather. See also Heller and Markland, ~~The FBI depicts the pattern as follows, for 1985:~~

²⁸ Here the contention is that aggression serves to relieve stress. This is consistent with the frustration-aggression theory described earlier (see, for example, Henry and Short). An alternative school of thought depicts violence as occurring either in response to the fight-or-flight choice itself or for the purpose of removing obstacles, thus obviating the need for making the fight-or-flight choice (Rothenberg). This view is also consistent with the portrayal of an individual pursuing particular objectives, as represented in his or her utility function.

²⁹ See Eyer (1977b) and Rothenberg.

³⁰ The effect of a given level of harm on its recipient, however, may depend not only on aggressive acts taken by one party but also on characteristics of the person being harmed. This is the problem of the "eggshell skull"; as detailed in the next section, it is taken into account by associating with each level of harm inflicted a probability that the injury results in death. See, e.g., *State v. Frazierman*, 399 Mo. 982, 98 S.W.2d 707 (1936) (affirming manslaughter conviction for death of hemophiliac after a single blow).

³¹ Sherman and Berk, in field experiments, find also that stronger deterrent effects are associated with particular forms

of sanction, such as immediate arrest in cases of domestic assault. In addition to the criminal sanctions, a defendant may be liable for civil damages. See Keeton, Dobbs, Keeton and Owen at 7-13, 220-234.

³²The potency of social sanctions is illustrated by experiments conducted by S. E. Asch in which a group of "subjects" was shown a line of a given length -- ten inches, for example -- and asked to choose which of three other lines (e.g., six, ten, and twelve inches long) matched the length of the first. With all "subjects" but the last instructed to choose the same incorrect line, a sizable number of true subjects succumbed to group pressures and deliberately chose the incorrect line also. Cf. Pollack, at page 586:

"The social basis of family loyalty rests generally on accepted norms or standards of conduct regarding the treatment of family members which are enforced through reputation..."

³³See Gelles (1972, 1977) and Henry and Short. Conceivably, this kind of learning could be represented in a model like that of Stigler and Becker, describing experiential human capital accumulation.

For a critical review of perceptual studies on deterrence generally, embodying legal, social and internal sanctions, see Williams and Hawkins.

³⁴The specific activity (or bundle of activities) which presents an alternative to aggression may differ among individuals, but for a given individual is known. One may think of the price of the activity as the cost of having a good day, whether in recreation, employment outside the home, home production activity or another activity. I am indebted to Paul Courant for this interpretation.

³⁵Here it is assumed that the relevant functions can be manipulated to permit statement in explicit form as indicated. In this context, utility in the usual sense is measured by the increase in utility above its initial level, i.e., $U-U^*$.

³⁶It is assumed that all forms of legal penalty can be stated in terms of a single variable, by using appropriate weights for fines and incarceration. The relevant empirical tool to be used in measuring sentence -- e.g., the legally prescribed maximum, minimum, determinate sentence, or expected value -- will depend upon local laws and custom.

³⁷In the event that $y = \lim_{x \rightarrow \infty} y(x)$, that is, the penalties for assault approach those for homicide as the seriousness of the assault approaches homicide, the function reverts to a simpler form.

³⁸ Concerning the legal significance of intent, acts taken, and harmful consequences of acts, see Fletcher (pages 115-122, 235-241); Keeton, Dobbs, Keeton and Owen; and Schulhofer. Here it is assumed that the harm occurs as intended or that death occurs.

³⁹ Homicide is perhaps the best-enforced of all crimes, receiving high priority throughout the criminal justice process. In contrast, assault is among the least enforced: Police are reluctant to intervene, particularly in domestic quarrels; "disturbance calls" to police constitute the single largest source of assaults on officers and the third highest source of on-the-job deaths (FBI; see also Parnas). Prosecutors fear that complainants will fail to testify and leave the case dangling for want of its primary witness (Lachman, 1975). Courts have also hesitated to intervene: Truninger discusses cases in which spousal immunity in tort actions was asserted as necessary for the preservation of the family, on the basis that interfering with family violence "would destroy the peace and harmony of the home." But see Moran v. Beyer, 734 F.2d 1245 (7th Cir. 1984), in which the U.S. Court of Appeals struck down an Illinois statute providing for interspousal immunity from tort claims. Finding the statute not to be rationally related to the state's goal of fostering "harmony", the court declared the statute unconstitutional on equal protection grounds.

⁴⁰ Alternatively, one could introduce the effects of social and internal sanctions through changes in the utility function itself. The approach taken in the paper is employed, first, because it is consonant with the customary assumption that the structure of preferences remains constant from one moment to the next; and second, because the close linkage between these sanctions and the legal ones is consistent with the behavioral science literature.

⁴¹ Durkheim discusses some of the nineteenth century international data in support of this thesis (although he disagrees with it). For a more recent discussion see Henry and Short. Palmer, however, finds homicide and suicide to be substitutes only when violence as a whole is generally high.

⁴² The question of how these aspirations are determined (and revised) has been dealt with in the behavioral literature also. See, for example, Gelles (1972), Strauss, and Davies (1962, 1969). Davies and subsequent writers have called this the "J-curve model" in which economic improvement generally -- for example, decreased unemployment -- raises aspirations, but achievement lags expectations and then falls.

⁴³ See also Williams (1984), for a more recent analysis supporting the thesis that poverty is a major economic source of homicide.

¹⁴The FBI data include 14.5% as stranger-on-stranger homicides, which arise largely in the course of other (typically property) crimes: these assailants are generally very young. Were the "stranger" cases to be separated out, the remaining distribution would align even better with the life cycle proxy.

¹⁵This representation is considered a proxy rather than the actual variable since the number of own children under age five will tend to underestimate number of children (and therefore, possibly stage of the life cycle) for some families, and the effect may not be randomly distributed.

Employing data from both the FBI and Census, a simple regression (without disaggregation) yields $R^2 = .67$ where observations are by age groups and "percentage of assailants" is the dependent variable. If one disaggregates the Census data by income group, the same pattern recurs, translated to other positions in the plane.

¹⁶Ax and Cannon, for example, note a "unitary visceral excitement" reaction common to both anger and fear.

¹⁷See Gurr at page 611. Cf. U.S. National Advisory Committee on Civil Disorders, at page 63 (civil disorders "are unusual, irregular, complex, and, in the present state of knowledge, unpredictable social processes"); Chalmers and Shelton (statistical analysis of riots in which authors found pattern in the changes in the "intensity" of a disorder hour by hour over the course of the disorder); Oberschall (analysis of costs and benefits of conflict, and application of analysis to U.S. riots of the 1960s).

¹⁸The functions depict, for each party, the following response pattern: To a party, say party I, the price of aggression depends upon the harm inflicted on I by II; this is represented by the symbol H_2 and enters the conflict function (7) via the term a_1 , as shown by equation (8). To party I, then, changes in the value of H_2 affect the price of conflict to which I reacts; this reaction is manifested in the value H_1 , the harm inflicted by I. To this harm (analogous to output by I), party II responds in an analogous fashion, manifested in harm H_2 inflicted by II against I.

In taking the harm "received" to be a scalar, rather than a strategy or function of its own, these actors follow the approach of Bertrand or Cournot duopolists -- who take the behavior of a rival to be fixed, even as they revise their own behavior in response to moves by the rival. See Cournot, Bertrand. The response functions themselves, however, follow neither the Bertrand nor Cournot formulation precisely, for here the counterpart of quantity (or output) "produced" by one actor is manifested in the price faced by the other, and vice-versa. The behavior is instead more like that of actors who are simultaneously bilateral monopolists in "both directions": not

only is I a monopsonist in purchasing II's output, and II a monopoly seller of it, but I is also a monopoly seller of its output, and II the monopsonist purchasing it. See also Fellner, at pages 240-251 (bilateral monopoly isomorphism to duopoly theory, within a restricted frame).

⁴⁹This latter possibility is analogous to arguments made by some nations favoring "arming for peace," in order to increase the response options available in the context of international conflict.

⁵⁰Here, the Marshallian definition of stability is employed, since the choice variables of the parties are mutually exclusive.

⁵¹Cf. Kenneth Boulding, at pages 228-248 (discussing stability of equilibria in international conflict). Experimental researchers in decision theory have also observed "the escalation of commitment," particularly where individuals or groups are personally responsible for negative consequences: Such persons (as compared to ones with less responsibility) will commit the greatest amount of resources to a previously chosen course of action, even when the outcome of previous steps was negative. Where both sides incur losses, both increase commitment to their respective positions, and thus the failure or conflict escalates. See Max Bazerman and Margaret Neale (pp. 60-62).

⁵²If all pairs of parties to such conflict were to have response functions identical to those portrayed above, we would expect to find some outcomes at the low-injury equilibrium level, others at the higher equilibrium and few inbetween. A pattern of outcomes consistent with this assertion was observed by W. J. Horvath for both industrial strikes and armed conflicts; he found the expected duration of conflict to increase with the age of ongoing conflict. Although Kennan (1987) would attribute this result, at least for labor, to the heterogeneity of strikes -- some take place during the term of a contract and are resolved more quickly -- the evidence from estimation of mixed-distribution models does not offer a clear confirmation of this.

⁵³The same sort of consequences occur when technological change, e.g., in transportation or medical care, causes the lowest levels of harm resulting in death to increase -- thus shifting H_2 , for example, to the right.

⁵⁴The obvious limiting case arises when the decreased motor control effects begin to predominate the inhibition-relaxation effects; when this occurs, however, the individual is unable to carry out aggressive intent (independent of inhibition relaxation), and so the model as a whole does not apply. See the report of the National Commission on Marijuana and Drug Abuse. MacDonald suggests that illness and fatigue have effects similar to those of drugs (page 21).

⁵See Phillips, Votey, and Howell.

⁶For examples, see Ehrlich (1975), who incorporates other-party consumption into the individual's utility function, Becker's 1968 paper on crime, and Wolpin; and more generally, Cock and Wilson.

⁷See, for example, Comprehensive Crime Control Act of 1983: Hearings Before the Subcommittee on Criminal Law of the Committee on the Judiciary, U.S. Senate, 98th Congress, first session, on S. 829 (Serial No. J-98-37), p. 57 (reserving federal death penalty for killing of top federal officials); see also Bowers (1984), p. 38 (in the northeastern states, capital punishment has typically been reserved for the murder of a police officer or prison guard).

⁸This difference in policy conclusion arises because a collection of possible offenses (for convenience, assumed to be a continuum from zero to lethal personal injury) is included in the analysis of a single decision. The simple deterrence model -- in which increased penalties result in decreased number of crimes -- would yield the same results as the present model only for the special case of dichotomous choice. For a different explanation as to why a death penalty might increase homicides, see Bowers and Pierce at 273-302.

In addition, research suggests that capital punishment does not deter violence, even if that punishment is exclusively reserved for capital crimes (Lempert, 1981), and that much of the reduction of criminality associated with stiffer penalties is attributable not to deterrence but to incapacitation of the would-be criminals (Wolpin). For a more extensive discussion of theoretical statistical problems associated with studying deterrence of the death penalty, see Barnett and Leamer.

⁹See Sherman and Berk, who found, in experimental study, that victims of domestic violence reported removal of the assailant from home to be more effective than counseling alone in preventing subsequent violence.

¹⁰See Richardson (1960a,b) and Rapoport.

¹¹Richardson (1960b). Other "pacifiers" included the deterrence afforded by armed strength, a concept more applicable here to discussions of the price of conflict behavior.

¹²MacDonald's second suggested outlet -- volunteer participation on execution squads -- raises the curious possibility that the use of the death penalty could reduce murder, operating not so much as a deterrent but as an substitute for illegal executions which the volunteers might otherwise carry out.

⁶³ Both Brenner (1976) and Eyer (1977a,b) independently attempt to link various indicators of mental and physical health with macroeconomic conditions, each of these researchers finding levels of violence to be countercyclical. For the other indicators of mental well-being, however, the two authors differ principally on the appropriate lag structure to be used. Using sizable lags (e.g., often two to three years for some physiological manifestations of stress, such as heart disease), Brenner concludes that recessions lead to unhappiness and unhealthiness. Utilizing shorter lags, Eyer argues for "prosperity as a cause of death," attributing the same physiological manifestations to the stress of overwork, rather than the stress of unemployment. Several caveats should be added, as the authors acknowledge: First, the observed effects are for relatively large changes in the macroeconomic climate; Brenner and Eyer are concerned primarily with recession (or depression) and recovery. Second, the authors do not account for a number of other relevant factors: for example, to the extent that law enforcement is primarily carried out by state and local governments whose revenues fall during recessions, the consequent deterrent effect (absent from these models) may be inappropriately attributed to the environmental variables instead.

What both analyses lack -- and what allows the lag question to remain a riddle -- is the critical link between the macro-economic indicators and the levels of stress experienced by individuals. The present paper closes part of the gap; but in addition, one needs a more micro analysis of the markets for labor, recreation, housing, etc., in order better to understand the course and the timing of individual response to changes in the macroeconomic environment.

An earlier paper by W. A. Lunden, in which agricultural product prices represent favorability of the economic climate in Iowa, found a strong negative relationship between those prices and the frequency of homicide in that state. See also Wolpin, who finds a positive relationship between occurrence of violent crimes and unemployment, using time series and cross-sectional data.

⁶⁴ See Freeman and Medoff at pages 178-179, 218-219.

⁶⁵ Within this labor conflict theory, two special cases are of interest: (1) Ascribing to Hicks' bargaining theory a counterpart model of strikes, one finds that in the Hicks formulation, the parties are anticipated always to be in their respective submissive ranges, that is, in the range where management responds to a long strike by raising its wage offer, and the union responds to a bleak wage picture by cutting additional strike duration. (2) The Ashenfelter and Johnson model depicts conflict under conditions in which the union is assumed to be in its submissive range, while management waits for the union to resolve its differences and accept a reasonable offer.

'' Indeed, the incidence and duration of strike move in opposite directions to one another over the business cycle: incidence is procyclical and duration countercyclical (Kennan, 1985, 1986). Both incidence and duration, however, have been found to be positively related to wage increases (Gramm, 1984), so that what changes over the cycle may be the aggregate balance of the two, perhaps as a function of changed legal and social sanctions, as well as other factors.

REFERENCES

- Abbott, E., "The Civil War and the Crime Wave of 1865-70,"
SOCIAL SCIENCE REV., 7 (1927):212-234.
- Ankeny, Robert, "Big Stress Payoffs Common," DETROIT NEWS,
(Sept. 28, 1984), page A1.
- Archer, Dane, and Rosemary Gartner, "Violent Acts and Violent
Times: A Comparative Approach to Postwar Homicide Rates,"
AMERICAN SOCIOLOGICAL REV., 41 (Dec. 1976):937-963.
- Asch, S. E., "Effects of Group Pressure Upon the Modification
and Distortion of Judgment," in H. Guetzkow (ed.), GROUPS,
LEADERSHIP, AND MEN. Pittsburgh: Carnegie Press, 1951.
- Ashenfelter, Orley A., and George E. Johnson, "Bargaining
Theory, Trade Unions, and Industrial Strike Activity,"
AMER. ECON. REV., 59 (March 1969):35-49.
- Ax, A., "The Physiological Differentiation of Fear and Anger,"
PSYCHOM. MED., 15 (1953):433-442.
- Axelrod, Robert, THE EVOLUTION OF COOPERATION, New York: Basic
Books, 1984.
- Barnard, George W., Lynn Robbins, Gustave Newman and
Frank Carrera, "A Study of Violence Within a Forensic
Treatment Facility," BULL. OF AM. ACADEMY OF PSYCHIATRY
AND THE LAW, 12(4) (1984):339-348.
- Barnett, Arnold, "Some Distribution Patterns for the Georgia
Death Sentence," U.C. DAVIS LAW REV., 18 (1985):1327-1374.
- Bazerman, Max, M. and Margaret A. Neale, "Heuristics in
Negotiation: Limitations to Effective Dispute
Resolution," in M. Bazerman and R. Lewicki (eds).
NEGOTIATING IN ORGANIZATIONS, Beverly Hills: Sage
Publications, Inc., 1983.
- Bebchuk, Lucian A., "Litigation and Settlement Under Imperfect
Information," RAND J. ECON., 15 (Autumn 1984):404-415.
- Becker, Gary, "Crime and Punishment: An Economic Approach,"
J. POLIT. ECON., 76 (March/April 1968):169-217.
- Becker, Gary, "A Theory of Social Interactions," J. POLIT.
ECON., 82 (Nov./Dec. 1973):1063-1093.
- Becker, Gary, A TREATISE ON THE FAMILY, Chicago: Univ. of
Chicago Press, 1981.
- Berk, Richard A., Correspondence, University of California,
Santa Barbara, June 1977.

- Beikow tz, Leonard, AGGRESSION: A SOCIAL PSYCHOLOGICAL ANALYSIS. New York: McGraw-Hill, 1962.
- Bertrand, Joseph, "Theories des Richesses," JOURNAL DES SAVANTS (1833):499-508.
- Bettelheim, Bruno, "Individual and Mass Behavior in Extreme Situations," J. OF ABNORMAL AND SOCIAL PSYCHOLOGY, 38 (1943):417-452.
- Block, Michael & John Heincke, A Labor Theoretic Analysis of the Criminal Choice, AMER. ECON. REV. 65 (June 1975):314-325.
- Boulding, Kenneth E., CONFLICT AND DEFENSE. New York: Harper & Row, 1962.
- Bowen, William G. and T. Aldrich Finegan, THE ECONOMICS OF LABOR FORCE PARTICIPATION. Princeton, N.J.: Princeton University Press, 1969.
- Bowers, William J., with Glenn L. Pierce, and John F. McDevitt, LEGAL HOMICIDE: DEATH AS PUNISHMENT IN AMERICA, 1862-1982. Boston: Northeastern University Press, 1984.
- Brenner, M. Harvey, "Estimating the Social Costs of National Economic Policy: Implications for Mental and Physical Health, and Criminal Aggression," Paper No. 5 in U.S. Congress, Joint Economic Committee, ESTIMATING SOCIAL COSTS OF NATIONAL ECONOMIC POLICY: IMPLICATIONS FOR MENTAL AND PHYSICAL HEALTH, Vol. 1 of Achieving the Goals of the Employment Act of 1946. Washington, D.C.: U.S. Government Printing Office, 1976.
- Buss, Arnold H., THE PSYCHOLOGY OF AGGRESSION. New York: Wiley, 1961.
- Calvan, Terry, "Discrimination on the Basis of Arrest Records," CORNELL LAW REVIEW, 56 (Feb. 1971):470-488.
- Cannon, W. B., BODILY CHANGES IN PAIN, HUNGER, FEAR AND RAGE. New York: Appleton & Co., 1929.
- Caustairs, George M., "Overcrowding and Human Aggression," in Hugh Davis Graham and Ted Robert Gurr (eds.), VIOLENCE IN AMERICA. New York: Bantam Books, 1969, 751-764.
- Cave, Jonathan A. K., "Refinements of Sequential Equilibrium in a Legal Settlements Case," The Rand Corp., (March 1986):P-7212.
- Chalmers, James A. and Robert B. Shelton, "An Economic Analysis of Riot Participation," ECON. INQUIRY, 13 (1975):322-336.
- Cook, Philip J., "Punishment and Crime: A Critique of Current Findings Concerning the Preventive Effects of Punishment," LAW & CONTEMP. PROBS., 41 (Winter 1977):164-204.

- Cournot, Augustin, RESEARCHES INTO THE MATHEMATICAL PRINCIPLES OF THE THEORY OF WEALTH. (1838, trans. Nathaniel T. Bacon) reprinted New York: MacMillan, 1971.
- Cross, John G., THE ECONOMICS OF BARGAINING. New York: Basic Books, 1969.
- Danziger, Sheldon, and David Wheeler, "The Economics of Crime: Punishment or Income Redistribution," REV OF SOC. ECON., 33 (OCTOBER 1975):113-131.
- Danzon, Patricia, and Lee A. Lillard, "Settlement Out of Court: The Disposition of Medicine Malpractice Claims," J. LEGAL. STUD., 12 (June 1983):345-377.
- Davies, James C., "The J-Curve of Rising and Declining Satisfactions as a Cause of Some Great Revolutions and a Contained Rebellion," in Ted Gurr, VIOLENCE IN AMERICA. New York: Bantam Books, 1969, 690-730.
- Davies, James C., "Toward a Theory of Revolution," AMER. SOCIOLOGICAL REV., 27(1) (Feb. 1962):5-19.
- De Menil, George, BARGAINING: MONOPOLY POWER VERSUS UNION POWER. Cambridge, MA: MIT Press, 1971.
- Dollard, John, Leonard W. Doob, Neal E. Miller, O. H. Mowrer, and Robert R. Sears, FRUSTRATION AND AGGRESSION. New Haven, CT: Yale University Press, 1939.
- Dollard, John, and Neal E. Miller, PERSONALITY AND PSYCHOTHERAPY, AN ANALYSIS. New York: McGraw-Hill, 1950.
- Durkheim, Emile, SUICIDE. New York: The Free Press, 1951.
- Edgeworth, F., MATHEMATICAL PSYCHICS. London: 1881, reprinted 1932.
- Ehrlich, Isaac, "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation," J. POLIT. ECON., 81 (May 1973):521-565.
- Ehrlich, Isaac, "The Deterrent Effect of Capital Punishment: A Question of Life and Death," AMER. ECON. REV., 65 (June 1975):397-417.
- Eyer, J., "Prosperity as a Cause of Death," INTERNATIONAL J. OF HEALTH SERVICES, 7 (1977):125-150.
- Eyer, J., and P. Sterling, "Stress-Related Mortality and Social Organization," REV. OF RADICAL POLIT. ECON., 9 (Spring, 1977): 1-44.

- Faiber Henry S., "Bargaining Theory, Wage Outcomes, and the Occurrence of Strikes: An Econometric Analysis," AM. ECON. REV. 68 (1978):262-271.
- Fellner, William, J., COMPETITION AMONG THE FEW. New York: A.M. Kelley, 1960.
- Fleisher, Belton M., THE ECONOMICS OF DELINQUENCY. Chicago: Quadrangle Books, 1966.
- Fleisher, Belton M., The Effects of Unemployment in Delinquent Behavior," J. POLIT. ECON., 71 (1963):545-555.
- Fletcher, George, RETHINKING CRIMINAL LAW. Boston: Little, Brown & Co., 1978.
- Freeman, Richard and James Medoff, WHAT DO UNIONS DO? New York: Basic Books, Inc., 1984.
- Freud, Sigmund, "Civilization and Its Discontents, [1930]," in Strachey, J., London ed. and trans. COMPLETE PSYCHOLOGICAL WORKS Vol. 21, pages 59-145. Hogarth Press, 1961.
- Friedman, M., R. H. Rosenman, and V. Carrol, "Changes in the Serum Cholesterol and Blood Clotting Time in Men Subjected to Cyclic Variation of Occupational Stress," CIRCULATION, 17 (1958): 825-861.
- Geerken, Michael, and Walter Gove, "Deterrence, Overload, and Incapacitation: An Evaluation of Three Explanations of the Negative Correlation Between Crime and Punishment," SOCIAL FORCES (Dec. 1977):424-447.
- Gelles, Richard J., THE VIOLENT HOME. Beverly Hills: Sage, 1972.
- Gibbs, Jack, "Crime, Punishment, and Deterrence, "SOCIAL SCIENCE QUARTERLY, 48 (1968):515-530.
- Gibbs, Jack, SUICIDE. New York: Harper & Row, 1968.
- Gould, John, "The Economics of Legal Conflicts," JOURNAL OF LEGAL STUDIES, 2 (June, 1973): 279-300.
- Gove, Walter R., James W. Grimm, Susan C. Motz, and James D. Thompson, "The Family Life Cycle: Internal Dynamics and Social Consequences," SOCIOLOGY AND SOCIAL RESEARCH, 57 (Jan. 1973): 182-195.
- Gurr, Ted Robert, "A Comparative Study of Civil Strife," in High Davis Graham and Ted Robert Gurr (eds.), VIOLENCE IN AMERICA. New York: Bantam Books, 1969.

- Hamermesh, Daniel, "An Economic Theory of Suicide," J. POLIT. ECON., 82 (Jan./Feb. 1974):83-98.
- Harsanyi, John C., "Measurement of Social Power, Opportunity Costs and the Theory of Two-Person Bargaining Games," BEHAVIORAL SCIENCE, 7 (1962):67-80.
- Heller, Nelson B., and Robert E. Markland, "A Climatological Model for Forecasting the Demand for Police Service," J. RESEARCH IN CRIME AND DELINQUENCY (July 1970):167-176.
- Henry, Andrew F., and James F. Short, Jr., SUICIDE AND HOMICIDE: SOME ECONOMIC, SOCIOLOGICAL AND PSYCHOLOGICAL ASPECTS OF AGGRESSION. Glencoe: Free Press, 1954.
- Hicks, John, THEORY OF WAGES. London: MacMillan, 1963 (2nd ed.).
- Hirshleifer, Jack, "The Economic Approach to Conflict," U.C.L.A. Department of Economics Working Paper No. 320 (January 1984).
- Hirshleifer, Jack, "Economics from a Biological Viewpoint," J. LAW AND ECON., 20 (April 1977):1-52.
- Homans, G. C., SOCIAL BEHAVIOR: ITS ELEMENTARY FORMS. New York: Harcourt Brace Jovanovich, 1961.
- Horvath, W. J., "A Statistical Model for the Duration of Wars and Strikes," BEHAVIORAL SCIENCE, 13 (1968):18-28.
- Johnson, Harry Golden, "Optimum Tariffs and Retaliation," in Harry G. Johnson, (ed.), INTERNATIONAL TRADE AND ECONOMIC GROWTH, Cambridge, MA: Harvard University Press, 1967.
- Keeton, W. Page, Dan B. Dobbs, Robert E. Keeton, and David G. Owen, PROSSER AND KEETON ON THE LAW OF TORTS, 5th ed. St. Paul: West Pub. Co., 1984.
- Kennan, John, "The Duration of Strikes in U.S. Manufacturing, 28 J. OF ECONOMETRICS (1985):3-27.
- Kennan, John, "The Economics of Strikes," in HANDBOOK OF LABOR ECONOMICS (1986):North-Holland.
- Kerr, Clark and Abraham Siegel, "The Interindustry Propensity to Strike -- An International Comparison," in A. Kornhauser, R. Dubin and A. Ross, INDUSTRIAL CONFLICT, New York: McGraw-Hill, 1954.
- Klein, L., Brian Forst and Filatov, "The Deterrent Effect of Capital Punishment: An Assessment of the Estimates," in A. Blumstein, J. Cohen and D. Nagin (eds.) DETERRENCE AND INCAPACITATION (1978).

- Lachman, Judith A., "Daring the Courts: Trial and Bargaining Consequences of Minimum Penalties," YALE LAW J., 90(Jan. 1981):597-631.
- Lardes, William, "An Economic Analysis of the Courts," J. LAW ECON., 14(April 1971):61-107.
- Leamer, Edward, "Let's Take the Con Out of Econometrics," AM. ECON. Rev., 73 (March, 1983):31-43.
- Lempert, Richard O., "Desert and Deterrence: An Assessment of the Moral Bases of the Case for Capital Punishment," U. OF MICH. LAW REV., 79 (May 1981):1177-1231.
- Lorenz, Konrad, ON AGGRESSION. New York: Harcourt, 1966.
- Lurden, W. A., "Hogs and Homicides," J. CRIM. LAW, C. & P. S., 39 (1948):356-366.
- MacDonald, John M., THE MURDERER AND HIS VICTIM. Springfield, IL: Charles C. Thomas, 1961.
- Marnheim, Hermann, WAR AND CRIME. London: Watts & Co., 1941.
- Martin, Donald L., "An Ownership Theory of the Trade Union," Miami, Florida: University of Miami, mimeo, 1976.
- McLougall, Myres S. and W. Michael Reisman, INTERNATIONAL LAW IN CONTEMPORARY PERSPECTIVE. Mineola, NY: Foundation Press, 1981.
- Milgram, Stanley, OBEDIENCE TO AUTHORITY. New York: Harper & Row, 1975.
- Nash, John F., Jr., "The Bargaining Problem," ECONOMETRICA, 18 (April 1950):155-162.
- National Commission on Marihuana and Drug Abuse, DRUG ABUSE IN AMERICA; PROBLEM IN PERSPECTIVE. Washington, D.C.: United States Government Printing Office, March 1973.
- Oberschall, Anthony, "Protracted Conflict," in Mayer N. Zald and John D. McCarthy, (eds.), THE DYNAMICS OF SOCIAL MOVEMENTS. Cambridge, MA: Winthrop Publishers, Inc., 1973.
- Palmer, Stuart, "Murder and Suicide in Forty Non-Literate Societies," J. CRIM. LAW, 56 (Sept. 1965):320-324.
- Parnas, Raymond II, "The Police Response to Domestic Disturbance," WISCONSIN LAW REV. (Fall 1967):914-960.

- Pasternak, Stefan A., VIOLENCE AND VICTIMS. New York: Spectrum Publications, Inc., 1975.
- Phillips, Llad, Harold L. Votey, and John Howell, "Handguns and Homicide: Minimizing Losses and the Cost of Control," J. LEGAL STUD., 5 (June 1976):463-478.
- Plucknett, T., A CONCISE HISTORY OF THE COMMON LAW, 5th ed., 1956.
- P'ng, I. P. L., "Strategic Behavior in Suit, Settlement and Trial," BELL J. OF ECON., 14(1983a):539-550.
- Pokorny, Alex D., "Human Violence: A Comparison of Homicide, Aggravated Assault, Suicide, and Attempted Suicide," J. OF CRIM. L., 56 (Dec. 1965):488-497.
- Police Foundation, "Domestic Violence and the Police: Studies in Detroit and Kansas City," Washington, D.C.: Police Foundation, 1977.
- Polinsky, A. Mitchell and Steven Shavell, "The Optimal Use of Fines and Imprisonment," J. PUB. ECON., 24 (June 1984):89-99.
- Pollak, Robert A., "A Transaction Cost Approach to Families and Households," J. ECON LIT., 23 (June 1985):581-608.
- Posner, Richard, "An Economic Approach to Legal Procedure and Judicial Administration," J. OF LEGAL STUDIES, 2 (June 1973):399-458.
- Raiffa, Howard, THE ART AND SCIENCE OF NEGOTIATION. Cambridge, MA: Harvard University Press, 1982.
- Rapoport, Anatol, "Lewis Richardson's Mathematical Theory of War," J. CONFLICT RES., 1 (1957):249-299.
- Reder, Melvin W., "Theory of Union Wage Policy," REV. ECON. STATIST. (Feb. 1952):34-45.
- Reder, Melvin W. and George R. Neumann, "Conflict and Contract: The Case of Strikes," J. POLIT. ECON., 88 (1980):867-886.
- Reinganum, Jennifer F. and Louis L. Wilde, "Settlement, Litigation and the Allocation of Legal Costs," RAND J. ECON., 17 (Winter 1986):557-566.
- Richardson, Lewis F., ARMS AND INSECURITY. Pittsburgh: Boxwood Press; Chicago: Quadrangle Books, 1960.

- Richardson, Lewis F., STATISTICS OF DEADLY QUARRELS.
Pittsburgh: Boxwood Press; Chicago: Quadrangle Books,
1960.
- Rothenberg, Albert, "On Anger," AMER J. OF PSYCHIATRY, 128
(Oct. 1971):454-460. Reprinted in S. A. Pasternak,
VIOLENCE AND VICTIMS. New York: Spectrum Publications,
1975.
- Salant, Stephen W. and Gregory Rest, "Litigation of Questioned
Settlement Claims: A Bayesian Nash-Equilibrium Approach,"
THE RAND CORP. (December 1982): P-6809.
- Schachter, S., and J. E. Singer, "Cognitive, Social, and
Physiological Determinants of Emotional States,"
PSYCHOLOGICAL REV., 69 (1962):379-399.
- Schelling, Thomas C., THE STRATEGY OF CONFLICT. London:
Oxford University Press, 1960.
- Schulhofer, Stephen, "Harm and Punishment: A Critique of
Emphasis on the Results of Conduct in the Criminal Law,"
UNIV. OF PENN. LAW REV., 122 (June 1976):1497-1607.
- Scitvosky, Tibor, "A Reconsideration of the Theory of Tariffs,"
REVIEW OF ECONOMIC STUDIES, 9 (Summer 1942):89-110.
- Sherman, Lawrence W. and Richard A. Berk, "The Specific
Deterrent Effects of Arrest for Domestic Assault," AMER.
SOC. REV., 49 (April 1984):261-272.
- Stigler, George J., and Gary S. Becker, "De Gustibus Non Est
Disputandum," AMER. ECON. REV., 67 (March 1977):76-90.
- Strauss, Murray, "Foreword," in Richard J. Gelles, THE VIOLENT
HOME. Beverly Hills: Sage Publications, 1972.
- Thomas, Dorothy, SOCIAL ASPECTS OF THE BUSINESS CYCLE. New
York: Alfred A. Knopf, 1927.
- Tracy, Joseph, S., "Contract Negotiations and Strikes," New
Haven: Yale University (mimeo), 1984.
- Truninger, Elizabeth, "Marital Violence: The Legal Solutions,"
HASTINGS LAW JOURNAL, 23 (Nov. 1971):259-276.
- U.S. Census of the Population, 1980.
- U.S. Federal Bureau of Investigation, CRIME IN THE UNITED
STATES, 1974. Washington, D.C.: U.S. Government
Printing Office, 1975.

- U.S. President's National Advisory Commission on Civil Disorders, Report of the National Advisory Commission on Civil Disorders (1968).
- U.S. President's Commission on Law Enforcement and Administration of Justice, THE CHALLENGE OF CRIME IN A FREE SOCIETY. Washington, D.C.: U.S. Government Printing Office, 1967.
- Walton, Richard E. and Robert B. McKersie, A BEHAVIORAL THEORY OF LABOR NEGOTIATIONS. New York: McGraw-Hill Book Co., 1965.
- Williams, Kirk R., "Economic Sources of Homicide: Reestimating the Effects of Poverty and Inequality," AM. SOC. REV., 49 (April 1984):283-289.
- Williams, Kirk R., and Richard Hawkins, "Perceptual Research on General Deterrence: A Critical Review," LAW & SOC. REVIEW, 20 (No. 4, 1986):545-572.
- Williams, Kristen M., "The Effects of Victim Characteristics on the Disposition of Violent Crimes," in William F. McDonald, CRIMINAL JUSTICE AND THE VICTIM. Beverly Hills: Sage Publications, 1977.
- Wilson, James Q., THINKING ABOUT CRIME. New York: Basic Books, 1983 (2nd ed.).
- Wolfgang, Marvin, PATTERNS IN CRIMINAL HOMICIDE. Philadelphia: University of Pennsylvania Press, 1958.
- Wolpin, Kenneth I., "An Economic Analysis of Crime and Punishment in England and Wales, 1894-1967," J. POLIT. ECON., 86 (October 1978):815-840.
- Zeuthen, Frederik, PROBLEMS OF MONOPOLY AND ECONOMIC WARFARE. London: George Routledge and Sons, 1930.
- Zimring, Franklin E., "The Medium Is the Message: Firearm Caliber as a Determinant of Death From Assault," J. LEGAL STUD., 1 (1972):97-123.

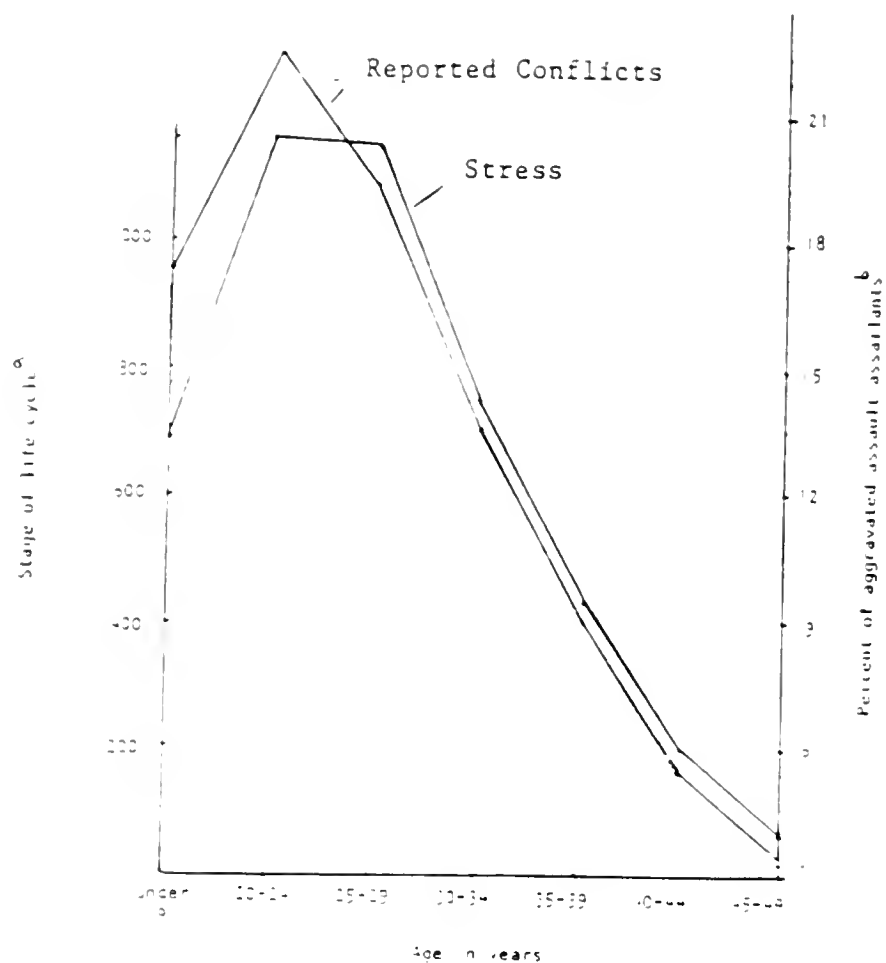


Figure 1. Relationship Between Assaults and Stage of the Life Cycle.

a: Life Cycle stage indexed by number of own children under age five, per thousand women not in the labor force, grouped by ages of mothers (U.S. Census, 1980).

b: Percent of assailants in each age group, excluding those under age fifteen and over age 49 (F.B.I., 1985).

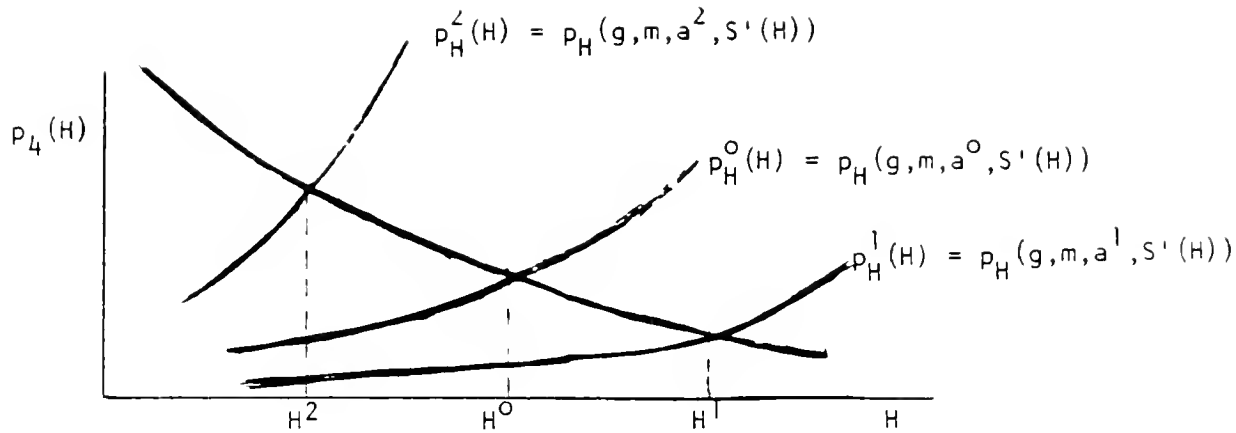


Figure 2. Effective penalties $p_H^0(H)_2$ as modified by anger ($p_H^1(H)$) and fear ($p_H^2(H)$).

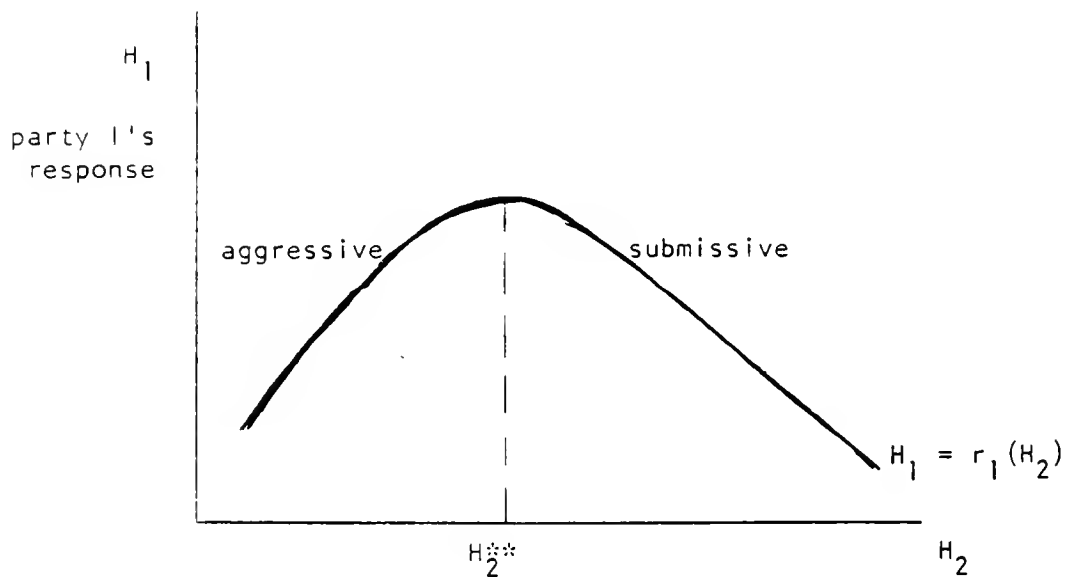


Figure 3. Response by party 1 to harm experienced (H_2)

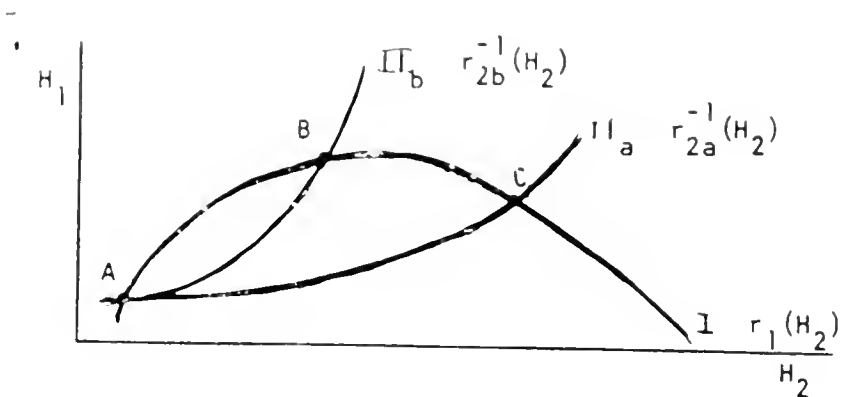


Figure 4. Examples of stable and unstable equilibria

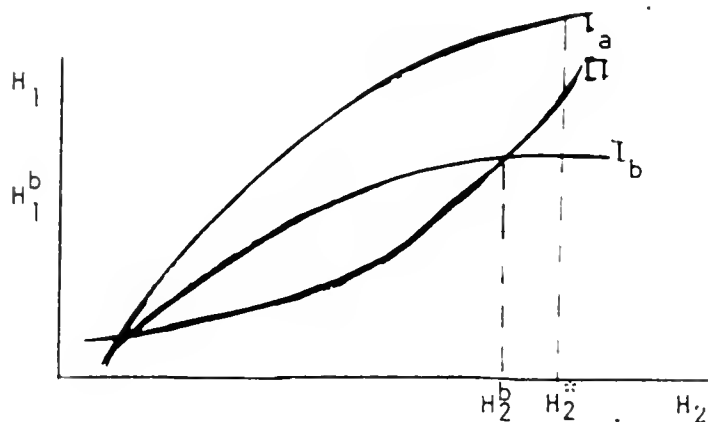


Figure 5. "Arms race" escalation supplanted by nondeath equilibrium

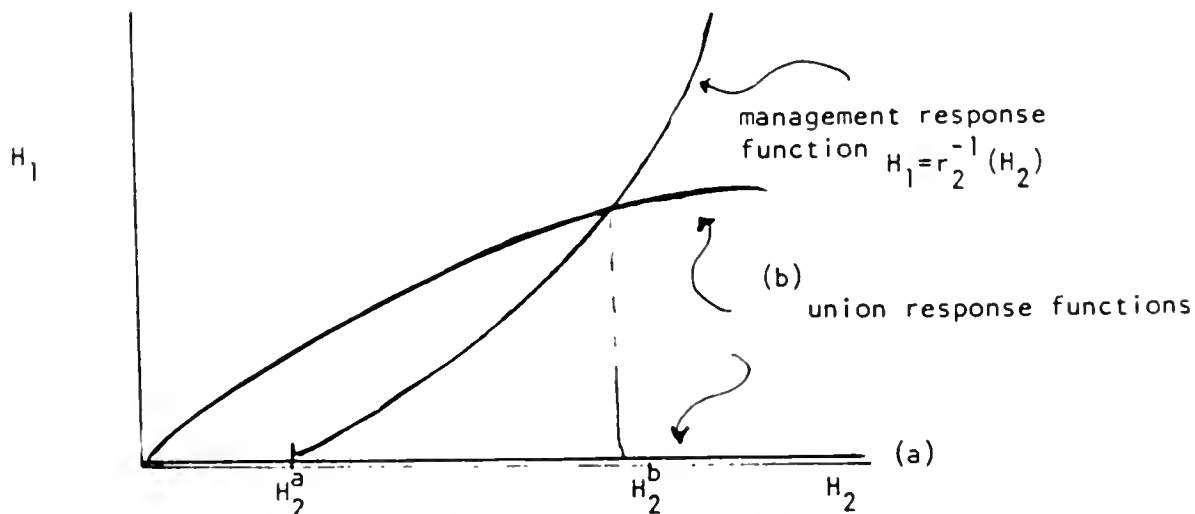


Figure 6. Conflict outcomes (a) when union has high internal sanctions, so that $H_1=0$; and (b) when union is in aggressive range.

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